REMARKS

Agent for Applicant presents original claims 1-32 and new claims 33-48 for reconsideration by the Examiner.

Claim Rejections and Claim Amendments

The Examiner stated that claims 1-32 were rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (US Patent No. 6,553,366). Agent for Applicant respectfully disagrees with the Office Action's characterization of the prior art for the reasons set out below.

First, it should be noted that Miller et al. was cited in the present application as being the most recent example of the "automatic summary table" (AST) idea (para. 10) and the extensive literature on AST's was briefly summarized with a view to distinguishing AST's from the present invention. Agent for Applicant respectfully submits that despite the apparent similarities between Miller et al. and the present invention, which were very thoroughly detailed by the Examiner, the "automatic summary table" concept and the accompanying systems required to implement this concept are fundamentally different from the invention claimed in the present application.

Agent for Applicant below summarizes how the present invention differs from Miller et al. In particular, Agent for Applicant hopes to explain to the Examiner that the Knowledge Table (or knowledge entity) and Knowledge Elements, along with the Analytical Engine, described in the present application are a uniquely valuable subject matter not anticipated by Miller et al., and moreover used together in ways not anticipated by Miller et al., thereby permitting updating, flexibility and functionality well beyond the scope of the Miller et al. patent.

Agent for Applicant hereby submits new dependent claims 33-48 which emphasize that the "Analytical Engine" of the present invention provides what we term "intelligent models". Unlike "static models" as described by Miller et al., intelligent models have the flexibility to adapt to dynamic situations. By definition [0019] they have one or more of the following characteristics: "the ability to immediately utilize new data, to purposefully ignore some data, to incorporate new variables, to not use specific variables and, if necessary, to be able to utilize these characteristics on-line (at the point of use) and in real time." Thus, there is tremendous improvement in terms of processing speed and efficiency, as well as the ability to create models

(i.e. an optimal model for achieving a desired result) dynamically in response to changes in the input to the model or to the conditions described by the model. For typical problems to which the Analytical Engine of the present invention is applied, the need to rerun for a change in variables would be very undesirable in terms of the time/processing required. Furthermore, the ability to create models dynamically (which follows from the particulars of the invention claimed and discussed below) is important in implementation of the invention certain to real life situations (as detailed in the application).

In short, the independent claims of the present invention comprise an "Analytical Engine" element. As particularized in the description, the Analytical Engine of the present invention is operable to dynamically adapt to changes in the Knowledge Elements. Miller et al. does not disclose or suggest this feature. Therefore, lacking at least this claimed element of the present invention, it cannot be said that Miller et al. anticipates the present invention, nor does it render it obvious. The remaining claims depend from the independent claims and are therefore patentable for at least these reasons.

Overview of Miller et al.

The focus of Miller et al. is on how to deal with a large, relational database. Miller et al. describe a myriad of quantities that can be pre-calculated, manipulated and stored to improve utilization of the data for many purposes, including mathematical modeling.

In contrast, the present invention is directed at how to produce mathematical models using data from any source, not only from relational databases. It shows how, surprisingly, certain key quantities (termed "Knowledge Elements") provide the means to generate a very large number of mathematical models. Furthermore, these quantities can be continually updated and manipulated as data flows into the "Analytical Engine" and hence the models too are updated and adapted to new situations. Identification and specific ways of using these few "Knowledge Elements" to generate modeling solutions are outside the scope of the Miller et al. patent and are central to the present invention.

In particular, the following fundamental differences between the present invention and Miller et al. should be noted:

1. The Scope of Miller et al. does not include data sources other than a "relational database".

- Every single claim in Miller et al. references a "relational database". In contrast, in the present application, Claims 1 to 10 reference "one or more data sources". Note that data sources can include other types of data base as well as "streaming data". A data source rather than a database is the only requirement.

- Miller et al. make the point that a relational database is different from a flat database and "proprietary data structures" (Col. 2, Lines 42 to 46). Also, there is no mention in the Miller et al. patent of streaming data.

- The present invention depends upon selection of quantities that allow streaming data to be handled (as well as having other important properties). In the long list of quantities that Miller et al. list there is mention of cross products (Col. 6, Lines 60-63). However, they are grouped in with other summations and quantities which cannot directly accept new data (e.g., Covariance, Correlation, etc.). Also, some of the quantities identified in the present application as being Knowledge Elements are not identified as worth accumulating in the matrices described by Miller et al. (e.g., n values in Figure 3 of the present application versus the matrix described by the function BLDMAT (Col. 9, Lines 5 to 10). The matrix described in the present application (e.g., Figure 3, which is termed a "Knowledge Table") holds specific, uniquely important quantities used in very specific ways for each modeling method and is different than any matrix described by Miller et al.

2. The Miller et al. patent does not include a method for continually admitting new data to the system.

- There is no mention of adding new data to the database. Conventionally, such databases are increased in size and all quantities re-calculated on a reasonably long time period (e.g., a month). The fact that only a few key quantities can be easily updated with new data and then serve as the basis for many other needed results is emphasized in the present application but not recognized in Miller et al.

- Miller et al. does not teach that the database can be incrementally updated with new data. The word incremental (or its derivatives) does not appear in their patent. In the present application, "incremental" appears many times (notably in Claims 9, 29 and in the "Summary

of the Invention". In the single mentions of "dynamic" and "updating" (Miller et al. Col. 11, Line 67 and Col. 12, Lines 1 to 4) the update refers to changes in the "logical entities and attributes definitions" from "parameterization of the advanced analytic processing" and "with results of the advanced analytic processing". Parameters are synonymous with "coefficients" or "constants to be determined" in a model. Changes in "parameterization" refers to the usual changes in the number of such "constants" and depend upon the results. For example, if data is better fit by a curved line than a straight line equation then the fit of the straight line will be inadequate and this result can be used to change the number of coefficients to three from two in order to fit a curve. There is no mention of incorporating new data. Thus, this has nothing to do with updating as described in the present application where the specifically selected "Knowledge Elements" are changed because of the addition of new data.

3. The Miller et al. system is significantly different from the system in accordance with the present invention.

- The present application describes an Analytical Engine linked to a data management system where the role of the data management system is to utilize the Knowledge Elements to generate all of the required results. There may not even be a database connected to the system. In contrast, the Miller et al. patent specifically has a "relational database management system" (Col. 20, Line 25 to 29).

- As additional evidence that Miller et al. were not thinking of handling data beyond their relational database, as the Office Action points out, their "analytic logical data model" is actually integrated with the relational database 116. The present invention involves an Analytical Engine that includes a data management system. The system in accordance with the present invention is especially designed to update the "Knowledge Elements" and hence adapt the models to new data. Even, if as the Office Action suggests, it is allowed that Miller et al. can "include a relational database without departing from the scope of the invention", that does not solve the problem of their close ties to the relational database.

- Matrix manipulations of the few identified "Knowledge Elements" are utilized in the present application to provide the basis for modeling using any and all of several different techniques. In Miller et al. no systematic method of using the many variables and computed quantities is described. The "Knowledge Table" described in the present application is not described by Miller et al. The approach taught by Miller et al. return to the raw data in the

relational database each time they wish to update their various matrices to obtain a change in the model.

4. The Miller et al. system is incapable of dealing with process control applications in "real-time".

- Miller et al. does not teach how their system could be used for process control applications. In contrast, the present application does. This again illustrates that Miller et al. describes a system generally suitable only for (one or more) relational databases without dynamic addition of new data. The present invention provides a dynamic model where dynamic means capable of continually adapting the model equations to changes in time in "real-time" if necessary.

The following are specific comments in response to points raised by the Examiner.

Claims 1, 10, 11, 17 and 21

The Examiner stated that as per claims 1, 10, 11, 17 and 21 Miller et al. discloses a computer implemented system for enabling data analysis comprising a computer linked to one or more data sources and an Analytical Engine.

For reasons mentioned above, Agent for Applicant respectfully submits that Miller et al. does not disclose or suggest an Analytical Engine that relies on one or more plurality of Knowledge Elements to enable "Intelligent Modelling". For instance, the Analytic LDM 200 does not actually allow for the handling of new data beyond that which is within the relational database 116, among other things. In this regard, it also cannot be said that Miller et al. discloses linking a computer with one or more data sources. For at least these reasons, Miller et al. lacking these claimed elements cannot be said to anticipate the present invention as claimed, nor does it render it obvious.

Claims 2 and 22

The Examiner stated that Miller discloses the computer implemented system claimed in claim 1, wherein the analytical engine defines one or more knowledge entities, each of which is comprised of at least one knowledge element.

In response, Agent for Applicant respectfully submits that the method in Miller et al. uses variables in a conventional way, and they are not selected as "Knowledge Elements" as they are in the present application. The application is directed to a person of a skill in the art, and such a person would understand the distinction.

In any event, claims 2 and 22 depend from claim 1 and 21 and are therefore patentable for at least the reasons cited above.

Claims 3 and 23

The Examiner stated that Miller et al. discloses the computer implemented system as claimed in claim 2, wherein the analytical engine is adapted to update dynamically the knowledge elements with a plurality of records and a plurality of variables.

As discussed herein, Miller et al. does not teach a "dynamic" process method. The Miller et al. method is a conventional model development process where different models are tried. "Real time" adaptability is not described. Note the discussion of this fact in para. 11 of the present application.

In any event, claims 3 and 23 depend from claim 1 and 21 and are therefore patentable for at least the reasons cited above.

Claims 4 and 24

The Examiner stated that Miller et al. discloses the computer implemented system claimed in claim 2, wherein the knowledge entity consists of a data matrix having a row and a column for each variable, and wherein the knowledge entity accumulates sets of combinations of knowledge elements for each variable in the intersection of the corresponding row and column.

The matrices described by Miller et al. sometimes include some of the components of the Knowledge Table of the present invention, but are at least incomplete and sometimes not suited to dimension reduction (or what Miller et al. terms "data reduction" (Col. 6, Lines 59 to 63)). The term "data reduction" should be distinguished from the term "dimension reduction". A better definition for "data reduction" would be a reduction in the quantity of data that needs to be utilized. Then "dimension reduction" could be used to describe a reduction in the number of variables (e.g., reducing from a curved line equation involving three variables to a straight

line equation involving two variables would be an example of dimension reduction). Note that many of the matrices described by Miller et al. (Col. 9, Lines 5 to 10) really can accomplish only data reduction (e.g., a correlation matrix).

In any event, claims 4 and 24 depend from claim 1 and 21 and are therefore patentable for at least the reasons cited above.

Claims 5 and 25

The Examiner stated that Miller et al. discloses the computer implemented system as claimed in claim 4, wherein the analytical engine enables variables and/or records to be dynamically added to, and subtracted from the knowledge entity.

The addition of new variables as described by Miller et al. is different than that described in the present application. In Miller et al., new variables are transformations applied to the raw data (specified in Col. 8, Lines 5 to 60). Miller et al. uses a raw data matrix to accomplish their aim. (Raw data matrix means the value of the variables in the rows and the values of the observations in columns.) Miller et al. seem to recognize that the raw data can be compressed into a smaller table (Col. 8, Lines 60 to 67) but have not discovered that, when correctly formulated as the Knowledge Table of the present invention; adding or deleting new variables only requires manipulation of the rows and columns of the Knowledge Table. In other words, Miller et al. returns to the raw data to generate their matrices. The present invention deals only with the Knowledge Table, manipulating and updating it as necessary.

In any event, claims 5 and 25 depend from claim 1 and 21 and are therefore patentable for at least the reasons cited above.

Claims 6 and 26

The Examiner stated that Miller et al. discloses the computer implemented system claimed in claim 5, wherein the analytical engine enables the deletion of a variable by deletion of the corresponding row and/or column, and wherein the knowledge entity remains operative after such deletion (the knowledge entity is able to use scalable data mining functions after the deletion).

Again, Miller et al. obtains flexibility from the raw data rather than from the Knowledge table described in the present application. They could use BLDMAT to generate a table of Sum

of Squares and Cross Products (SSCF) which would certainly streamline computation. However, they don't teach what sum of squares and cross products and other terms (e.g., *n* values) should be tabulated to accomplish all the modeling power and flexibility that the present application describes. For a new variable, the table is regenerated from the raw data with the required number of rows and columns and passed on for further calculations (Col. 8, Lines 60 to 67). Note that the RSTMAT function described in Col. 9, Lines 13 to 15 calls the BLDMAT function when the model fails. They do not describe deleting rows and columns from their SSCF table to accomplish the needed data reduction (i.e. introduction of the needed new variables to have a successful model). Also, their SSCF function would have to be specified as containing the same terms as does the present application's Knowledge Table for the row and column deletion method to work and it is not.

In any event, claims 6 and 26 depend from claim 1 and 21 and are therefore patentable for at least the reasons cited above.

Claims 7 and 21

The Examiner stated that Miller et al. discloses the computer implemented system claimed in claim 5, wherein the analytical engine enables the addition of a variable by addition of a corresponding row and/or column to the knowledge entity, and wherein the knowledge entity remains operative after such addition (the knowledge entity is able to use scalable data mining functions after the addition).

The patentability of claim 1 was discussed above. Claim 7 depends from claim 1 is therefore patentable for at least the reasons cited above.

Claims 8 and 28

The Examiner stated that Miller et al. discloses the computer implemented system claimed in claim 5, wherein an update of the knowledge entity by the analytical engine does not require substantial re-training or re-calibration of the knowledge elements.

Agent for Applicant submits that the economy of effort described by Miller et al. does not match the economy of effort described by present application et al. since the manipulations of the Knowledge Table in the present application are not described by Miller et al.

In any event, claims 8 and 28 depend from claim 1 and 21 and are therefore patentable for at least the reasons cited above.

Claims 9 and 29

The Examiner stated that Miller et al. discloses the computer implemented system claimed in claim 2, wherein the analytical engine enables application to the knowledge entity of one or more of incremental learning operations, parallel processing operations, scenario testing operations, dimension reduction operations, dynamic query operations or distributed processing operations.

Miller et al. does not mention incremental learning operations, or other aspects of Intelligent Modelling as explained above. With regards to parallel processing operations they refer to the conventional "massively parallel processing computer system". This dependence on hardware is far different from parallel computing as permitted by the present invention. Present application allows conventional desktop computers to be used for parallel processing.

In any event, claims 9 and 29 depend from claim 1 and 21 and are therefore patentable for at least the reasons cited above.

Claims 12 and 18

The Examiner stated that Miller et al. discloses a method of enabling parallel processing, comprising the steps of providing an analytical engine, executed by a computer, that relies on one or more of a plurality of knowledge elements to enable intelligent modeling, wherein the analytical engine includes a data management system for accessing and processing the knowledge elements, subdividing one or more databases into a plurality of parts and calculating a knowledge entity for each part using the same or a number of other computers to accomplish the calculations in parallel, combining all or some of the knowledge entities to form one or more combined knowledge entities. Applying the intelligent modeling to the knowledge elements of the combined knowledge entities so as to engage in data analysis (data analysis is engaged when results, are formulated).

As discussed herein, the system of the present invention differs significantly from the Miller et al. system. In particular, Miller et al. does not disclose or suggest an Analytical Engine that relies on one or more plurality of Knowledge Elements to enable Intelligent

Modelling. Lacking at least these claimed elements, it cannot be said that Miller et al. anticipates claim 12, nor does it render it obvious. Claim 18 depends from claim 1 and is therefore patentable for at least the reasons cited above.

Claim 13

The Examiner stated that Miller et al. discloses the method of enabling scenario testing, wherein a scenario consists of a test of a hypothesis, comprising the steps of providing an analytical engine, executed by a computer, that relies on one a more of a plurality of knowledge elements to enable intelligent modeling, wherein the analytical engine includes a data management system for accessing and processing the knowledge elements, whereby the analytical engine is responsive to introduction of a hypothesis to create dynamically one or more new intelligent models.

As stated, Miller et al. does not disclose or suggest an Analytical Engine that relies on one or more plurality of Knowledge Elements to enable Intelligent Modelling. Lacking at least these claimed elements, it cannot be said that Miller et al. anticipates claim 13, nor does it render it obvious.

Claim 14

The Examiner stated that Miller et al. discloses a method of enabling dimension reduction, comprising the steps of providing an analytical engine, executed by a computer, that relies on one or more of a plurality of knowledge elements to enable intelligent modelling, wherein the analytical engine includes a data management system for accessing and processing the knowledge elements reducing the number of variables in the knowledge entity by the analytical engine defining a new variable based on the combination of any two variables, and applying the new variable to the knowledge entity.

As stated, Miller et al. does not disclose or suggest an Analytical Engine that relies on one or more plurality of Knowledge Elements to enable Intelligent Modelling. Lacking at least these claimed elements, it cannot be said that Miller et al. anticipates claim 14, nor does it render it obvious.

Claim 15

The Examiner stated that Miller et al. discloses the method as claimed in claim 14, further comprising the step of successively applying a series of new variables so as to accomplish further dimension reduction.

Claim 15 depends from claim 14 and is therefore patentable for at least the reasons mentioned above.

Claim 16

The Examiner stated that Miller et al. discloses a method of enabling dynamic queries, providing an analytical engine, executed by a computer, that relies on one or more of a plurality of knowledge elements to enable intelligent modeling, wherein the analytical engine includes a data management system for accessing and processing the knowledge elements, establishing a series of questions that are directed to arriving at one or more particular outcomes, applying the analytical engine so as to select one or more sequences of the series of questions based on answers given to the questions, so as to rapidly converge on the one or more particular outcomes.

As stated, Miller et al. does not disclose or suggest an Analytical Engine that relies on one or more plurality of Knowledge Elements to enable Intelligent Modelling. Lacking at least these claimed elements, it cannot be said that Miller et al. anticipates claim 16, nor does it render it obvious.

Claim 17

The Examiner stated that Miller et al. discloses a method of enabling distributed processing, providing an analytical engine, executed by a computer, that relies on one or more of a plurality of knowledge elements to enable intelligent modeling, wherein the analytical engine includes a data management system for accessing and processing the knowledge elements, whereby the analytical engine enables the combination of a plurality of knowledge entities into a single knowledge entity, applying the intelligent modelling to the single knowledge entity.

As stated, Miller et al. does not disclose or suggest an Analytical Engine that relies on one or more plurality of Knowledge Elements to enable Intelligent Modelling. Lacking at least

these claimed elements, it cannot be said that Miller et al. anticipates claim 17, nor does it render it obvious.

Claim 19

The Examiner stated that Miller et al. discloses the computer implemented system claimed in claim 19, wherein the knowledge entity is portable to one or more remote computers.

Claim 19 depends from claim 1 and is therefore patentable for at least the reasons mentioned above.

Claim 20

The Examiner stated that Miller et al. discloses the computer-implemented system claimed in claim 1, wherein the intelligent modeling applied to relevant knowledge elements enables one or more of a series of applications.

Claim 20 depends from claim 1 and is therefore patentable for at least the reasons mentioned above.

Claim 30

The Examiner stated that Miller et al. discloses a computer-implemented system as claimed in claim 1, wherein the analytical engine enables process control.

Claim 30 depends from claim 1 and is therefore patentable for at least the reasons mentioned above.

Claim 31

The Examiner stated that Miller et al. discloses the computer-implemented system as claimed in claim 30, wherein the analytical engine enables fault diagnosis.

Claim 31 depends from claim 1 and is therefore patentable for at least the reasons mentioned above.

Claim 32

The Examiner stated that Miller et al. discloses a method according to claim 11, wherein the method is implemented in a digital signal processor chip or any miniaturized processor medium.

Claim 32 depends from claim 11 and is therefore patentable for at least the reasons mentioned above.

CONCLUSION:

In view of the foregoing amendments and remarks, the application is believed to be in condition for allowance and a notice to that effect is respectfully requested.

Should the Examiner not find the application to be in allowable condition or believe that a conference call would be of value in expediting the prosecution of the application, Applicant requests that the Examiner telephone the undersigned Counsel to discuss the case.

Applicant requests an opportunity to submit any Supplemental Amendment that might advance prosecution and place the application in allowable condition.

Yours faithfully,

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